

APPROVED ADMIXTURES FOR USE IN CONCRETE

The list of Approved Admixtures for Use in Concrete is published periodically for reference primarily by Caltrans field personnel and others involved in Caltrans projects.

As per State of California, Department of Transportation, Standard Specifications (July 1995), Section 90-4.03, no admixture brand will be used in the work unless it is on Caltrans current list of approved brands for the type of admixture involved. Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory, 5900 Folsom Blvd., Sacramento, CA 95819, a sample of the admixture accompanied by certified test results which verify that the admixture complies with the requirements in the appropriate ASTM designation. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the specifications, based on the certified test results submitted, together with any tests Caltrans may elect to perform.

The Approved List includes only those admixtures that comply with the following ASTM designations:

C494 - Standard Specification for Chemical Admixtures for Concrete.	pp. 3 - 6
C260 - Standard Specification for Air-Entraining Admixtures for Concrete.	pp. 7 - 8
D98 - Standard Specification for Calcium Chloride.	p. 9
C618 - Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.	p. 10

The list provides certain essential data for field reference as well as general information that may assist in assessing properties of the plastic concrete.

The information contained herein may not be used for advertising purposes nor is it to be considered as an endorsement by Caltrans.

From ACI 212.1R, "Admixtures for Concrete"

5.2 - COMPOSITION

The materials that are generally available for use as water-reducing admixtures and set-controlling admixtures fall into five general classes:

1. Lignosulfonic acids and their salts
2. Modifications and derivatives of lignosulfonic acids and their salts
3. Hydroxylated carboxylic acids and their salts
4. Modifications and derivatives of hydroxylated carboxylic acids and their salts
5. Other materials, which include:

- (i) inorganic materials, such as zinc salts, borates, phosphates, chlorides,
- (ii) amines and their derivatives,
- (iii) carbohydrates, polysaccharides, and sugar acids,
- (iv) certain polymeric compounds, such as cellulose ethers, melamine derivatives, naphthalene derivatives, silicones, and sulfonated hydrocarbons.

These admixtures can be used either alone or in combination with other organic or inorganic, active or essentially inert substances.

NOTES:

* Chemical admixtures containing chlorides as Cl^- in excess of one percent by weight of admixture shall not be used in prestressed or reinforced concrete.

** When the Contractor is permitted to reduce cement content by adding chemical admixtures, the dosage of admixture shall be the dosage used in ASTM Designation: C494 for qualifying the admixtures.

† This admixture contains more than 1% chlorides as determined by California Test 415 and shall not be used in prestressed or reinforced concrete.

AE = Air Entrained

NAE = Non-Air Entrained

- Type A - Water-reducing admixtures
- Type B - Retarding admixtures
- Type C - Accelerating admixtures
- Type D - Water-reducing and retarding admixtures
- Type E - Water-reducing and accelerating admixtures
- Type F - Water-reducing, high range admixtures
- Type G - Water-reducing, high range and retarding admixtures

ASTM C 494 - Chemical Admixtures for Concrete

June 2000

					At the Qualifying ASTM Dosage(s), What Changes are Expected Relative to the Reference Concrete?			Dosage Rate Suggested by Manufacturer	
Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2

W. R. Grace and Company
7237 East Gage Ave.
Los Angeles, CA 90040

Revised December 30, 1999

ADVA Cast-1	F	Carboxylated Polyether	<1	6.3 (1997)	AE 15.3	More	AE 1.4	3.0 to 12.0	
ADVA Flow	F	Carboxylated Polyether	<1	6.0 (1995)	AE 12.8	More	AE 1.1	3.0 to 12.0	
ADVA 100	F	Carboxylated Polyether	<1	5.2 (1999)	15.5	More	AE 0.0	3.0 to 10.0	
Daracel	E	Calcium Chloride, Triethanolamine	>20	16.0 (1983)	AE 5.7	Less	AE (1.4)	8.0 to 40.0	†
Daracem 50	A	Lignin, Calcium Chloride, and Polymers	>8	5.0 (1992)	AE 7.6	Less	Negligible	5.0 to 7.0	†
Daracem 55	A	Lignin, Calcium/Sodium Nitrate, Polymer	<1	4.0 (1992)	AE 5.8	Less	AE 0.9	3.0 to 9.0	
Daracem 100	A, F	Naphthalene Sulfonate	<1	8 (1991)	AE 11.5	Less	AE 0.3	9.0 to 11.0	
Daracem 100	G	Naphthalene Sulfonate	<1	12 (1991)	AE 15.0	Less	AE 3.3	12.0 to 15.0	
Daracem ML 330	F	Melamine- Formaldehyde Polymer	<1	14.5 (1998)	AE 15.4	More	AE 1.2	6.0 to 25.0	
Daracem ML 500	A, F	Melamine and Naphthalene Sulfonate Formaldehyde Co-Polymers	<1	12.0 (1999)	AE 12.0	More	AE 0.4	6.0 to 25.0	
Daratard 17	B, D	Hydroxylated Organic Compounds	<1	3.0 (1992)	AE 8	More	AE 2.0	2.0 to 7.0	
Darex Corrosion Inhibitor	C	Calcium Nitrite Aqueous Solution	<1	78.0 (1979)	Negligible	Same	AE (2.0)	50.0 to 170.0	
Daracem 19 (formerly WRDA 19)	A, F	Naphthalene-Sulfonate Formaldehyde Copolymer	<1	8.0 to 25.0 (1981)	AE 20 to 30	Less	AE 0.5 to 1.0	8.0 to 25.0	
Daraset	C	Calcium Nitrate Solution	<1	45.0 (1994)	AE 4	Same	A (1.0)	20.0 to 50.0	
Polarset	C	Calcium Nitrate/ Nitrite Solution	<1	30.0 (1994)	AE 5	Same	A (3.0)	8.0 to 100.0	
WRDA 20	A	Glucose Polymers, Lignosulfonate, and Amine	<1	2.5 (1985)	AE 6.8	Less	AE 1.0	2.5	
WRDA 64	A	Lignosulfonate, Amine, and Glucose Polymer	<1	3.0 (1979)	AE 11	Less	AE 1.4	3.0 to 5.0	

ASTM C 494 - Chemical Admixtures for Concrete

June 2000

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Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2

WRDA 79	A, D	Modified Lignosulfonate	<1	5.0 to 7.5 (1980)	AE 8 to 10	Less	AE 1.0 to 2.2	4.0 to 10.0	
WRDA 82	A	Lignosulfonate and Amine	<1	3.0 (1983)	AE 6.1	Less	AE 0.2	3.0	
WRDA w/Hycol	A	Organic Compounds w/Hydration Control Agent	<1	3.0 and 5.0 (1974)	AE 5 to 7	Less	AE (0.3) to 1.3	3.0 to 5.0	
Recover	D	Hydroxycarboxylic Acid Salts	<1	5.0 (1992)	AE 9.0	Same	AE 1.7	2.0 to 16.0	

Hill Brothers Chemical Co.
1675 N. Main Street
Orange, CA 92667

HICO 610	A	Sodium Lignosulfonate	<1	5.0 (1987)	NAE 5.7	Not Tested for Air Entrained Concrete	NAE (1)	5.0 to 12	
HICO 911	C	Polymer Modified Calcium Chloride	>33	24 (1992)	NAE 2.7	Not Tested for Air Entrained Concrete	NAE (2.0)	32 to 64	†

Master Builders
23700 Chagrin Blvd.
Cleveland, OH 44122

Revised December 30, 1999

Pozzolith 400-N	A, F	Naphthalene Sulfonate	<1	15.0 (1991)	AE 28	More	AE 0.2	10.0 to 20.0	
Delvo Stabilizer	B, D	Salts of Organic Agent	<1	4.0 (1992)	AE 7.8	Less	AE 1.1	2.0 to 130	
Master Pave N	A	Glucose Polymer	<1	2.0 (1989)	AE 6.0	Less	AE 0.4	2.0 to 4.0	
MBL-82	A	Lignin	<1	5.0 (1991)	AE 7	Less	AE 0.3	5.0 to 10.0	
MBL-82	B, D	Lignin	<1	8.0 (1990)	AE 9.5	Less	AE 1.6	5.0 to 10.0	
Polyheed	A	Lignosulfonate, Triethanolamine, Ammonium Thiocyanate	<1	7.0 (1991)	AE 6.1	Same	AE 0.4	3.0 to 12.0	
Polyheed RI	B, D	Cement Dispersing Agent	<1	4.0 (1994)	AE 7.6	Less	AE 1.25	3.0 to 12.0	
Polyheed FC 100	A,C,E ,	Cement Dispersing Agent	<1	9.0, 15.0 (1998)	AE 6.7	More	AE (0.7)	8.0 to 30.0	
Pozzolith NC 534	C	Cement Dispersing Agent	<1	27.0 (1993)	AE 5.7	More	AE (1.7)	10.0 to 45.0	

ASTM C 494 - Chemical Admixtures for Concrete

June 2000

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Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2

Polyheed 997	A	Lignosulfonate Triethanolamine	<1	5.0 (1990)	AE 6.9	Less	AE 0.4	3.0 to 12.0	
Polyheed 997	F	Lignosulfonate Triethanolamine	<1	8.0 (1990)	AE 12.3	Less	AE 0.3	3.0 to 12.0	
Pozzolith 100-XR	B, D	Glucose Polymer	<1	2.5 (1993)	AE 6.1	Same	AE 1.5	2.0 to 4.0	
Pozzolith 122 HE	C, E	Cement Dispersing Agent	>24	17.0 (1998)	AE 5.5	More	AE (1.1)	16.0 to 64.0	
Pozzolith 200 N	A,B,D	Cement Dispersing Agent	<1	4.0 (1998)	AE 6.9	Less	AE 0.7	3.0 to 5.0	
Pozzolith 220 N	B, D	Polymer, Triethanolamine	<1	3.5 (1991)	AE 5.8	Less	AE 1.8	2.0 to 5.0	
Pozzolith 220-N	A	Polymer, Triethanolamine	<1	2.0 (1991)	AE 6.2	Less	AE 0.5	2.0 to 5.0	
Pozzolith 300 N	A	Polymer, Triethanolamine	<1	3.0 (1990)	AE 7-8	Less	AE 0.3	3.0 to 5.0	
Pozzolith 300-R	B, D	Polymer	<1	5.0 (1990)	AE 10	Less	AE 2.6	3.0 to 5.0	
Pozzolith 322-N	A	Polymer, Triethanolamine	<1	4.0 (1990)	AE 8.0	Less	AE 0.7	3.0 to 7.0	
Pozzolith 344-N	A	Calcium Chloride, Triethanolamine	>8	6.0 (1991)	AE 6.5	Less	AE 0.6	3.0 to 9.0	†
Pozzutec 20	C, E	Polymer	<1	15.0 (1990)	AE 5.5	More	AE 1.1	5.0 to 90.0	
Rheobuild 1000	A, F	Naphthalene Sulfonate	<1	15.0 (1988)	AE 18	Less	AE 0.4	5.0 to 25.0	
Rheobuild 2000 B	A, F	Cement Dispersing Agent	<1	10.0 (1994)	AE 13.9	More	AE 1.1	10.0 to 25.0	
Rheobuild 3000 FC	A, F	Based on Glenium Technology	<1	4.0 (1998)	AE 12.4	Less	AE 0.2	4.0 to 12.0	
RMC 121	A	Lignosulfonate Triethanolamine	<1	5.0 (1990)	AE 6.9	Less	AE 0.4	3.0 to 12.0	
RMC 121	F	Lignosulfonate Triethanolamine	<1	8.0 (1990)	AE 12.3	Less	AE 0.3	3.0 to 12.0	
Pozzolith 80	A, B, D	Cement Dispersing Agent	<1	3.0 (1998)	AE 6.8	Same	AE 0.2	4.0 to 10.0	

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Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2

Sika Chemical Corporation
1372 East 15th Street
Los Angeles, CA 90021

Plastocrete 161	A	Lignosulfate	<1	4 (1982)	AE 7.7	Same	AE 0.2	3.0 to 5.0	
Plastocrete 161 FL	C	Inorganic Salt-Organic Mixture	<1	16 (1987)	AE 5.4	Same	AE 1.25	12.0 to 24.0	
Plastocrete 161 HE	C	Calcium Chloride Triethylamine	>5	34 (1978)	AE 1.3	Less	AE (1.0)	6.0 to 64.0	†
Plastocrete 161 MR	B, D	Lignosulfonates	<1	2.9 (1989)	AE 7.4	Same	AE 2.4	3.0 to 6.0	
Plastocrete 169	A	Lignosulfonates	<1	4 (1985)	AE 8.73	Same	AE (0.25)	3.0 to 7.0	
Plastocrete 169	B, D	Lignosulfonates	<1	6 (1986)	AE 22	Same	AE 2.3	3.0 to 7.0	
Plastiment	B, D	Hydroxylated Carboxylic Acid	<1	4.0 (1990)	AE 7.3	Same	AE 3.1	2.0 to 4.0	
Sikament FF	F	Melamine Polymer	<1	12 (1994)	AE 12.2	Same	AE 1.3	10.6 to 21.2	
Sikament 86	F	Melamine Polymer	<1	12 (1994)	AE 14.4	Same	AE 0.7	10.6 to 21.2	
Sikament 300	F	Blend Sodium Alkylnaphthalene	<1	12 (1992)	AE 12.2	Same	AE 1.0	6.0 to 24.0	
Plastiment NS	A	Lignosulfonates	<1	4 (1996)	AE 7.6	Less	AE 1.1	2.0 to 4.0	
Sika-Rapid-1	C	RMF-1503	<1	20 (1996)	AE 3.1	Less	AE (1.6)	4.0 to 48.0	

Boral Material Technologies, Inc.
45 N. E. Loop 410, Suite 700
San Antonio, TX 78216

Revised December 30, 1999

Boral RDI	F,G	Sulfonated Naphthalene Formaldehyde	<1	4.0 (1990)	AE 15.3	Same	AE (1.0)	6.0 to 20.0	
Boral LR	A,D	Lignosulfonate	<1	6.0 (1997)	AE 8.0	Less	AE (1.1)	4.0 to 6.0	
Boral NR	A,D	Lignosulfonate Based Material	<1	3.0 (1997)	AE 6.7	Less	AE (1.2)	3.0 to 6.0	
Boral NW	A,D	Lignosulfonate Based Material	<1	3.0 (1997)	AE 7.5	Less	AE (0.2)	3.0 to 6.0	
Boral X15	A	Lignosulfonate Based Material	<1	4.0 (1993)	AE 5.4	Less	AE (0.1)	3.0 to 10.0	
Boral ACN	C, E	Blend of Admixture	<1	60.0 (1998)	AE 8.6	More	AE (1.6)	20.0 to 50.0	

ASTM C 494 - Chemical Admixtures for Concrete

June 2000

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Product or Brand Name	ASTM Type	Class or Composition	Chloride Content* %	Dosage Rates Used to Qualify for Appropriate ASTM Tests**, fl. oz. per 100 lbs. cement (report date)	Water Reduction, %	Change in AEA Dose Needed to Maintain Air Content	Initial Set Retardation, (Acceleration) hours	fl. oz. per 100 lbs. of cement	See Pg 2

Boral SP	A, F	Sulfonated Naphthalene Formaldehyde Condensate	<1	7.0 (1998)	AE 17.1	More	AE (0.2)	6.0 to 25.0	
Boral HC	A, B, D	Carbohydrate Salts	<1	2.5, 5 (1998)	AE 6.5 AE 7.3	Same Same	AE 0.6 AE 2.0	2-6	
Boral TR	B, D	Carbohydrate Salts	<1	4.0 (1998)	AE 6.8	Less	AE 3.1	3-6	
Boral LW*	A	Lignin Family	<1	3.0 (1997)	AE 9.5	Less	AE 0.3	3-10	
Boral HW	A	Lignin Family	<1	6.0 (1998)	AE 6.9	Less	AE 1.0	3-10	

* Boral HW contains calcium chloride, therefore not recommended for post tension and pre-stressed concrete.

The Euclid Chemical Company
19218 Redwood Road
Cleveland, Ohio 44110-2799
Tel. No: (216) 531-9222

June 1, 2000

Accelguard HE	E	Calcium Chloride based Material	31-35	24 (1997)	AE 6.3	More	(1.5)	16-32	
Eucon 37	A, F	Napthlene Sulfonate	<1	16 (1999)	AE 18.31	Same	AE 0.7	10-16	
Eucon Retarder 100	D	Sodium Gluconate	<1	3 (1999)	AE 6.4	Less	AE 1.9	2-6	
Eucon MR	A	Calcium Nitrate & Calcium Ligno Sulfonate Material	<1	6 (1999)	AE 7.1	Same	AE 1.1	4-10	
Eucon WR	A	Calcium-Sodium Ligno Sulfate	<1	5 (1997)	AE 8.3	Less	AE 0.5	4-5	
Eucon WR-91	A	Calcium Ligno Sulfonate	<1	3 (1999)	AE 6.4	Less	AE 0.6	2-6	

ASTM C 260 - Air-Entraining Admixtures for Concrete

May 2000

Product or Branch Name	Class or Composition	Chloride Content (percent)	Report Date	Dosage Rate Suggested by Manufacturer
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Master Builders
32700 Chagrin Blvd.
Cleveland, OH 44122

MBVR Standard	Vinsol Resin	<1	1991	0.4 to 4.0
MB-VR Concentrated	Vinsol Resin	<1	1992	0.4 to 4.0
MBAE-90 also called Pave Air 90	Rosin Soap	<1	1993	0.25 to 4.0
Micro-Air	Fatty acid Salts	<1	1991	1.0
Pave-Air	Vinsol Resin	<1	1992	1.0

W. R. Grace and Company
7237 East Gage Ave.
Los Angeles, CA 90040

Amex 210	Benzene Sulfonate Sodium Salt	<1	1989	0.5 to 8.0
Darex AEA	Organic Acid Salts	<1	1975	0.8
Darex II AEA	Alkaline Solution of Fatty Acid Salts	<1	1993	0.75 to 3.0
Daravair 1000	Neutralized Resin and Rosin	<1	1994	0.75 to 3.0
Daravair	Neutralized Resin and Rosin	<1	1994	0.75 to 3.0
Daravair M	Neutralized Vinsol Resin	<1	1975	1.0
Daravair AT 60	Aqueous Solution of Neutralized Vinsol Resin, Amine and Fatty Acids	<1	1994	0.5 to 3.0

Sika Chemical Corporation
1372 East 15th Street
Los Angeles, CA 90021

Sika AER	Neutralized Vinsol Resin	<1	1986	0.5 to 1.5
Sika AEA 15	Sodium Salt Type Soap	<1	1983	0.5 to 1.5
Sika AEA 14	Sodium Salt of an Organic Ester	<1	1996	0.5 to 3.0

Hill Brothers Chemical Company
1675 North Main St.
Orange, CA 92667-3442

HICO-315-L	Sodium Tall Oil Fatty Acid Soap	<1	1968	0.75 to 3.0
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ASTM C 260 - Air-Entraining Admixtures for Concrete

May 2000

Product or Branch Name	Class or Composition	Chloride Content (percent)	Report Date	Dosage Rate Suggested by Manufacturer
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Boral Material Technologies, Inc.
45 N. E. Loop 410, Suite 700
San Antonio, TX 78216

Boral Air 40	Resin Surfactant	<1	1997	1.0
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The Euclid Chemical Company
19218 Redwood Road
Cleveland, Ohio 44110-2799

AEA – 92	Synthetic Organic Chemicals based Admixture	<1	1992	½ to 1.0

ASTM D 98 - Calcium Chloride

May 2000

Product	Type or Composition (Solid or Solution)	Calcium Chloride Content in Percent (given for solution form only)	Grade (given for solid form only)
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Hill Brothers Chemical Company
1675 North Main St.
Orange, CA 92667-3442

HB-98	Solution	30.1	
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Lee Chemical, Incorporated
3113 McKinley Way
Costa Mesa, CA 92626

ASTM Grade	Solution	33.0	
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Cargill
Solarchem Resources
7200 Central Avenue
Newark CA 94560-4206

Liquid Calcium Chloride, Technical Grade, Treated	Solution	38.3	
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ASTM C 618 –Mineral Admixtures

May 2000

Company Name	Classification of Mineral Admixture	% Calcium Oxide (Range)
(1) Boral Materials Technology (formerly Western Ash Company) 7500 N Dreamy Draw, Suite 234 P.O. Box 7360 Phoenix, Arizona 85036		
(a) Navajo Fly Ash (Page, Arizona)	F	6.1 to 7.9
(b) Mojave Fly Ash (Laughlin, Nevada)	F	8.5 to 9.9
(c) Apache Fly Ash (Cochise, Arizona)	F	3.0 to 8.0
(d) Snowflake (Snowflake, Arizona)	F	3.0 to 4.2
(e) Monticello (Monticello, Texas)	F	7.1 to 8.0
(2) ISG Resources, Inc. 7525 S.E. 24th Street Mercer Island, Washington 98040		
(a) Centralia Fly Ash (Centralia, Washington)	F	7.6 to 8.0
(b) Jim Bridger Fly Ash (Rock Springs, Wyoming)	F	6.2 to 7.5
(c) IPSC/Delta Fly Ash (Delta, Utah)	F	9.1 to 9.9
(d) Hunter Fly Ash (Castle Dale, Utah)	F	7.9 to 9.9
(3) Phoenix Cement Company 2501 W. Behrend Drive P.O. Box 43740 Phoenix, AZ 85080		
(a) Cholla Fly Ash (Joseph City, Arizona)	F	3.1 to 5.0
(b) Four Corners Fly Ash (Fruitland, New Mexico)	F	2.4 to 2.8
(4) Mineral Resources Technologies, LLC 120 Interstate North Parkway East, Suite 440 Atlanta, GA 30339		
(a) Coronado Fly Ash (St. John, Arizona)	F	2.6 to 5.0